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ABSTRACT

A study was done to compare Asian American and Anglo American students' attitudes toward motivation, learning environment, academic self-concept, involvement, affiliation, and parent involvement in the learning of mathematics. Survey data of 1,200 Asian- and 1,200 Anglo-American middle school students were collected. A stratified sampling technique was attempted to include an equal number of students of each gender and grade within each ethic group. Three standardized instruments were adapted and administered concurrently by trained researchers during regular mathematics class. Data were analyzed with a three-way multivariate analysis. The results indicate that there are significant differences in motivation and perceptions of learning environment by students' ethnicity, gender, and grade-level. Asian American students demonstrated greater pride in their class work, a stronger desire to succeed, and higher expectations to do well in mathematics. They also enjoyed mathematics class and assignments more than did Anglo-American students and were more participative and attentive in class activities. Asian-American parents were usually more interested and more involved in what their children were doing in mathematics than were Anglo-American parents. Girls had higher motivation and more positive perceptions of their learning environment in mathematics than did boys. Contains 2 tables and 42 references. (JB)

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Comparing Asian- and Anglo-American Students' Motivation and Perceptions of the Learning Environment in Mathematics

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Comparing Asian- and Anglo-American Students' Motivation and Perceptions of the Learning Environment in Mathematics

During the past two decades, equality in education has become a critical issue. Educators have developed various multicultural programs which may best benefit students of various ethnic origins. Research on equity and excellence has been focused on the disadvantages of minority students and the educational differences between boys and girls. Research on ethnic minorities has received great attention from both public and private sectors. Numerous studies, for example, have concentrated on (a) examining remedial programs for at-risk or limited English proficiency (LEP) students, and (b) promoting the learning of heavily populated ethnic minorities such as black and Hispanic students (Allen, 1988; Dolly, Blaire, & Power, 1988; Galvan, Rubio, Padilla, 1987; Hornberger, 1990; Huang & Waxman, 1993a; Love, 1993; Rong & Preissle-Goetz, 1990 ; Waxman, 1989; Zanger, 1990). Relatively few studies, however, have specifically explored the education of Asian-American students or its comparison with students from other ethnic groups.

Among the handful studies on the equity issue related with Asian-American students, Asian-Americans' exceptional academic achievement has been viewed as a phenomenon and its contributing factors, including heredity and culture, have been examined in several studies (Peng, Owings, & Fetters, 1984; Karklanis & Tsai, 1988; Sue & Okazaki, 1990). Schneider and Lee (1990), for example, found a positive correlation between the Asian students' high achievement and the values that they share with their parents, the home learning activities in which families participate, and the expectations they share with their teachers and peers.

Other researchers have looked at Asian American students from a quite different perspective. They reported that a majority of Asian-American students struggle for their own identity, endure long-term adjustment stress to cultural differences and language barriers (most of their first languages are non-English), and search for understanding and sensitivity to their needs (Ascher, 1990; Coker, 1988; Tsang & Wing, 1985).

Little research has directly focused on the investigation of Asian-American students' motivation and perceptions of their learning environment, and how these are compared with majority students in the same classroom. It is very important, however, to deal with these questions because the close relationship between motivation, perceptions of learning environment, and student outcomes are well documented (Fraser, 1989, 1991; Knight & Waxman, 1991; Padron, 1992; Waxman, Huang, Knight, & Owens, 1992; Wittrock, 1986). Students' perceptions and reactions to their learning tasks and classroom instruction is more important than the actual quality of teaching behaviors in terms of influencing student outcomes (Knight & Waxman, 1991; Winne & Marx, 1977, 1982). Walberg (1986, 1988) further suggests fostering an effective classroom learning environment as a means of enabling at-risk students to succeed at schools. By examining the consistency and variance in motivation and perceptions among students of different ethnicity, grade, and gender, it is possible to explain the dimension and extent of actual differences to help educators generate policy and practice aimed at achieving educational equity. Therefore, the purpose of the present study is to compare Asian- and Anglo-American students' motivation and perceptions. More specifically, the present study addresses the following research questions:

(a) What are Asian- and Anglo-American students' motivation and perceptions of their mathematics learning environment in the dimensions of Academic Self-Concept, Achievement Motivation, Involvement, Affiliation, Satisfaction, and Parent Involvement?

(b) Are there significant differences between Asian- and Anglo-American students' motivation and perceptions of their learning environment in mathematics?

(c) Do students' motivation and perceptions of their learning environment in mathematics also differ by gender and grade-level?

(d) Are the gender and grade-related differences consistent across the two ethnic groups of students?

Methods

Subjects

The present study was conducted in five middle schools within a multicultural school district located in a major metropolitan city in the Central South region of the United States. The school district was selected because of the relatively large enrollment of Asian-Americans among minority students. About 20.4% of the students enrolled were Asian-Americans, 30.6% of them were Anglo-American, 26% of them were black, and 23% were Hispanics. Survey data of 1,200 Asian- and 1,200 Anglo-American students were collected. A majority of students in the district came from lower- to upper-middle income families. Their academic achievement was slightly higher than national norm. A stratified sampling technique was attempted to include an equal number of students of each gender and grade within each ethnic group.

Instruments

Three standardized instruments were adapted and incorporated for use: (a) the Multidimensional Motivational Instrument (Uguroglu, Schiller, & Walberg, 1981; Uguroglu & Walberg, 1986), (b) the Classroom Environment Scale (Fraser, 1986), and (c) the Instructional Learning Environment Questionnaire (Knight & Waxman, 1989).

The Multidimensional Motivational Instrument (MMI) is a questionnaire that measures the motivation constructs of Achievement Motivation, Academic Self-Concept, and Social Self-Concept. The instrument has been found to have test-retest reliability and construct and predictive validity. For the present study, only Achievement Motivation and Academic Self-Concept scales were used. A brief description of the scales follows:

Achievement Motivation--the extent to which students feel the intrinsic desire to succeed and earn "good" grades in school.

Academic Self-Concept--the extent to which students exhibit pride in their classwork and expect to do well in mathematics.

The Classroom Environment Scale (CES) contains six scales, each with four items. The content and concurrent validities of the CES have been established through correlational studies and classroom observation. Adequate internal consistency reliability coefficients were also obtained in previous studies (Fraser, 1982, 1986; Moos, 1979). For the present study, only Involvement and Affiliation scales were used. A brief description of the two scales follow:

Involvement--the extent to which students participate actively and attentively in class activities.

Affiliation--the extent to which students know, help, and are friendly toward each other.

The Instructional Learning Environment Questionnaire (ILEQ) measures students' perceptions of seven aspects of instructional learning environment. It has been found to be reliable in previous study (Knight & Waxman, 1989) For the present study, only Satisfaction and Parent Involvement scales were used. A brief description of the two scales follow:

Satisfaction--the extent of students' enjoyment of their mathematics class and work.

Parent Involvement--the extent to which parents are interested and involved in what their children are doing in mathematics.

All of the items were on a four-point Likert type scale. A response of "not at all true" scored 1 point; "not very true", 2 points; "sort of true", 3 points; and "very true", 4 points. Students' responses to each item within the same scale were added and averaged Consequently, a mean value of 4 indicates that the student responded favorably with the scale whereas a mean value of 1 indicated that the student responded unfavorably to the scale. In the present study, the reliability coefficients (Cronbach's alpha) of the six scales, Achievement Motivation, Academic Self-Concept, Involvement, Affiliation, Satisfaction, and Parent Involvement are .57, .54, .71, .64, .83, and .63 respectively.

Procedures

Three instruments were administered concurrently by trained researchers in the Spring, 1992 during the regular mathematics class. Students were informed by the researchers that they were not tests and that completed questionnaires would not be seen by their teachers or other school personnel. A

three-way multivariate analysis of variance (MANOVA) was used to determine (a) whether there are motivational and perceptional differences by students' gender, grade, and ethnicity, and (b) whether there are any interaction effects by gender and/or grade-level within each ethnic group. Because of the large sample size, the probability level was set at $p<.001$ for overall MANOVA results. As a follow-up procedure, univariate analysis of variance (ANOVA) and post hoc multiple comparison tests were also performed to determine where the significant differences were.

Results

Table 1 reports the three-way MANOVA results. The results indicate that there are significant main effects of ethnicity, gender, and grade on middle school students' motivation and perceptions of learning environment. Asian-American students' overall motivation and perceptions of their mathematics classroom learning environment were significantly different from Anglo-American students ($F(6,2383)=12.06$, $p<.001$). Asian- and Anglo-American students' overall motivation and perceptions of their learning environment also differed by gender ($F(6,2383)=11.45$, $p<001$) and grade-level ($F(12,4776)=11.70$, $p<.001$). However, there was no significant interaction effects of (a) ethnicity by gender, (b) ethnicity by grade, or (c) ethnicity by gender and grade. This suggests that the gender and grade effects did not differ from one ethnic group to another.

Table 2 presents the descriptive and univariate analysis of variance results of students' motivation and perceptions of ethnicity, gender, and grade level. In general, both Asian- and Anglo-American students had rather positive perceptions of their learning environment in mathematics. Both groups of

students scored high on the affiliation aspect and relatively low on the satisfaction aspect. Both groups of students also had high academic self-concept and achievement motivation (M>3.0). Nonetheless, Asian-American students' academic self-concept and achievement motivation were significantly higher than Anglo-American students. They were also more involved, more satisfied, and had greater parental involvement, but were less affiliated than Anglo-American students. The standard deviations for Anglo-American students were slightly higher than Asian-American students, suggesting that there was a greater variance among Anglo-American students' responses.

In regard to gender-related differences, girls scored almost equally high on academic self-concept as boys, but their achievement motivation was significantly higher than boys. In addition, Girls were more involved, affiliated and satisfied with their learning environment than boys. There was no significant differences in parent involvement between boys and girls.

Grade-level is another significant factor that differentiates students' motivation and perceptions. Students in the lower grade levels generally had greater achievement motivation and more favorable perceptions of learning environment. Sixth grade students had higher achievement motivation than seventh and eighth grade students. They were also more involved, affiliated, satisfied, and had greater parent involvement than students in the upper grades. Among upper grade students, seventh grade students were more involved, satisfied, and had greater parent involvement than eighth grade students. There was no significant difference in academic self-concept among students from the three grade levels.

Discussion

The results of the present study reveal that there are significant differences in motivation and perceptions of learning environment by students' ethnicity, gender, and grade-level. Although both Asian- and Anglo-American middle school students had high motivation and favorable perceptions, Asian students demonstrated greater pride in the classwork, stronger desire to succeed, and higher expectation to do well in mathematics. Because they enjoyed mathematics class and assignments more than Anglo-American students, they were more participative and attentive in class activities. Their parents were usually more interested and more involved in what their children were doing in mathematics than Anglo-American parents. These findings support previous research studies which similarly found that love of learning, deep determination to succeed, and family influence are some Asian-American students' characteristics which lead to their academic success (Brand, 1987; Karklanis & Tsai, 1989; Sue & Okazaki, 1990). Strong motivation and positive perceptions of mathematics learning environment may partially explain why Asian-American students typically have greater mathematics achievement than students from other ethnic groups.

On the other hand, Asian-American students had significantly lower affiliation than Anglo-American students. There are several plausible explanations for this discrepancy: (a) Asian-American students devote themselves in learning and have less time for socializing, (b) Asian parents may not encourage their children hanging around with friends for activities they consider non-educational, and (c) some newly immigrated Asian-American students may be limited in English proficiency and can not communicate well with other

students. Future research may examine the relationship of these factors on students' affiliation to justify these explanations

Unlike previous studies which found unequal practice in mathematics classroom in favor of boys (Hart, 1990; Nairn, 1991), results from the present study indicate that girls had higher motivation and more positive perceptions of their learning environment in mathematics than boys. Despite the many reports which documented that boys performed better than girls in mathematics achievement (Dossey, Mullis, Lindquist, & Chambers, 1988), girls similarly are expected to do well in mathematics and showed a even stronger desire to earn good grades than boys. Girls were also more participative and attentive in class, more affiliated with classmates, and enjoyed mathematics class more than boys. This suggests that the inequity in mathematics achievement may be attributable to other factors such as confidences in mathematics, level of anxiety, unequal teachers' expectation and/or attention, and so forth (Marrett, 1985; Nairn, 1991).

Middle school students at different grade-levels demonstrated different levels of motivation and perceptions of their learning environment in mathematics. In general, the lower the grade level, the more involved and satisfied they were. These findings were in agreement with a prior observation study which found that sixth grade students were more on task and less disruptive in the mathematics classroom than seventh and eighth grade students (Huang & Waxman, 1993b). Students at the three grade levels had homogeneously high academic self-concept, but their achievement motivation declined as grade level moved up, parallel to their perceptions of learning environment. Numerous variables may contribute to the downward trends. Perhaps the increasing difficulty in mathematics content had posed some stress on higher grade students. Perhaps the decreasing amount of parent interest and involvement also affected

student motivation. These findings raise some concerns. Educational researchers need to identify these variables and to provide strategies that may improve upper-grade students' motivation and perceptions.

The results of the presents study also reveal that within each ethnic group, the effects of grade and gender remained consistent. In other words, both Asian- and Anglo-American girls had higher achievement motivation and more favorable perceptions of learning environment than boys, and so were both Asian- and Anglo-American lower-grade students as compared to higher-grade students.

The findings of this study have educational implications. Since differences in motivation and perceptions of learning environment were detected among Asian- and Anglo-American student, boys and girls, and students of different grade levels, educational policy makers may apply these findings to develop policy and strategy that may enhance educational equity and excellence. Further research may need to examine other dimensions of motivation and learning environment to determine if there are other significant differences among students of various ethnic origins Future research may also investigate whether these findings sustain (a) across different subject areas such as reading, science, and social science, and (b) across high school as well as elementary school students to provide more comprehensive information about educational equity among different ethnic groups.

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Table 1

MANOVA Results of Ethnicity, Gender and Grade Effects on Students' Motivation and Perceptions of Learning Environment

Variable	Wilks' Lambda	df	F	p
Ethnicity	.9705	6,2383	12.06	.0001
Gender	.9720	6,2383	11.45	.0001
Grade	.9436	12,4766	11.70	.0001
Ethnicity x Gender	.9976	6,2383	.97	.4414
Ethnicity x Grade	.9963	12,4766	.74	.7152
Gender x Grade	.9954	12,4766	.91	.5356
Ethnicity x Gender x Grade	.9930	12,4766	1.40	.1581

Table 2

Descriptive and Univariate Analysis of Variance of Students' Motivation and Perceptions by Ethnicity, Gender and Grade

By Ethnicity

Variable	Asian (n=1200) M	SD	Anglo (n=1200) M	SD	F	p
Involvement	3.00	.66	2.84	.69	34.01	.0001
Affiliation	3.10	.61	3.18	.65	8.56	.0035
Satisfaction	2.95	.79	2.74	.85	37.31	.0001
Parent Involvement	3.03	.69	2.96	.69	6.74	.0095
Academic Self-Concept	3.22	.54	3.13	.62	16.34	.0001
Achievement Motivation	3.20	.55	3.08	.58	27.83	.0001

By Gender

Variable	Male (n=1200) M	SD	Female (n=1200) M	SD	F	p
Involvement	2.88	.69	2.97	.67	12.86	.0001
Affiliation	3.07	.65	3.21	.61	28.81	.0001
Satisfaction	2.78	.85	2.91	.80	15.05	.0001
Parent Involvement	2.98	.68	3.01	.70	1.13	.2880
Academic Self-Concept	3.18	.61	3.17	.56	.11	.7410
Achievement Motivation	3.08	.60	3.20	.53	27.54	.0001

Table 2 (con'd)

By Grade

Variable	6th Grade (n=800) M	SD	7th Grade (n=800) M	SD	8th Grade (n=800) M	SD	F	p
Involvement	3.06a	.63	2.96b	.67	2.76c	.70	42.93	.0001
Affiliation	3.20a	.60	3.11b	.66	3.11b	.63	5.70	.0034
Satisfaction	2.96a	.83	2.88a	.81	2.70b	.82	20.33	.0001
Parent Involvement	3.11a	.67	3.00b	.69	2.86c	.69	25.49	.0001
Academic Self-Concept	3.18	.57	3.18	.58	3.16	.59	.33	.7220
Achievement Motivation	3.22a	.54	3.12b	.59	3.08b	.56	13.46	.0001

Note: the same letter by the mean values indicates that there is no significant difference between the mean values.